How Hungry Are The White Tailed Deer at Fermilab?

Pre-Service Teacher Research Project

Fermi National Accelerator Laboratory

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August 5, 2004

The Big Woods of Fermi

- 250 acre wooded area.
- Walking path throughout
- Most plants in flowering bloom April-June
- Woodland Animals
  - White Tailed Deer
  - Rabbits
  - Coyote

Victoria A. Nuzzo

Impact of White-Tailed Deer Herbivory on Prairie & Forest Vegetation & Recovery of Heavily Browsed Vegetation

- 6 Part Study from 1992-1996
- 1)Determine ability of the groundlayer to recover if protected from deer herbivory, using open & closed plots.
- 2)Monitor growth of Trillium under browsing & no-browsing conditions.
- 3)Monitor structure of the forest groundlayer with uninterrupted deer browse.
- 4-6)Assess impact of deer browse on the prairies.
- Recommendations made for maintaining deer densities & monitoring vegetation conditions.

Deer Herbivory Produced Very Strong & Negative Impacts on Forest Vegetation

- Unbrowsed vegetation in the exclosed plots grew significantly taller after 1-2 years, & increased significantly in cover after 2-4 years.
- 200%-500% increase in cover.
- Vegetation in the open plots remained short and patchy, average cover declined over the 5 year period.
- 50%-70% decrease in cover.

An exclosed plot with the least vegetation initially had an large increase of cover (5%-25%). Even though still sparsely vegetated after 4 years of deer exclusion, the increase in cover indicates that even virtually barren forests have the potential to recover if protected from deer herbivory.

~Victoria A. Nuzzo

White Tailed Deer at Fermi

- Negative impacts on vegetation suspected to be caused by deer:
  - decreased frequency
  - decreased height
  - decreased cover
  - desirable browse species are eliminated
  - undesirable species increase in abundance

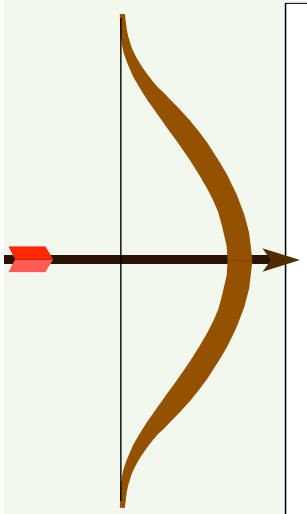
This time of year deer at Fermilab are hard to observe because they are attending to their young, browsing early morning or early evening in secluded areas.

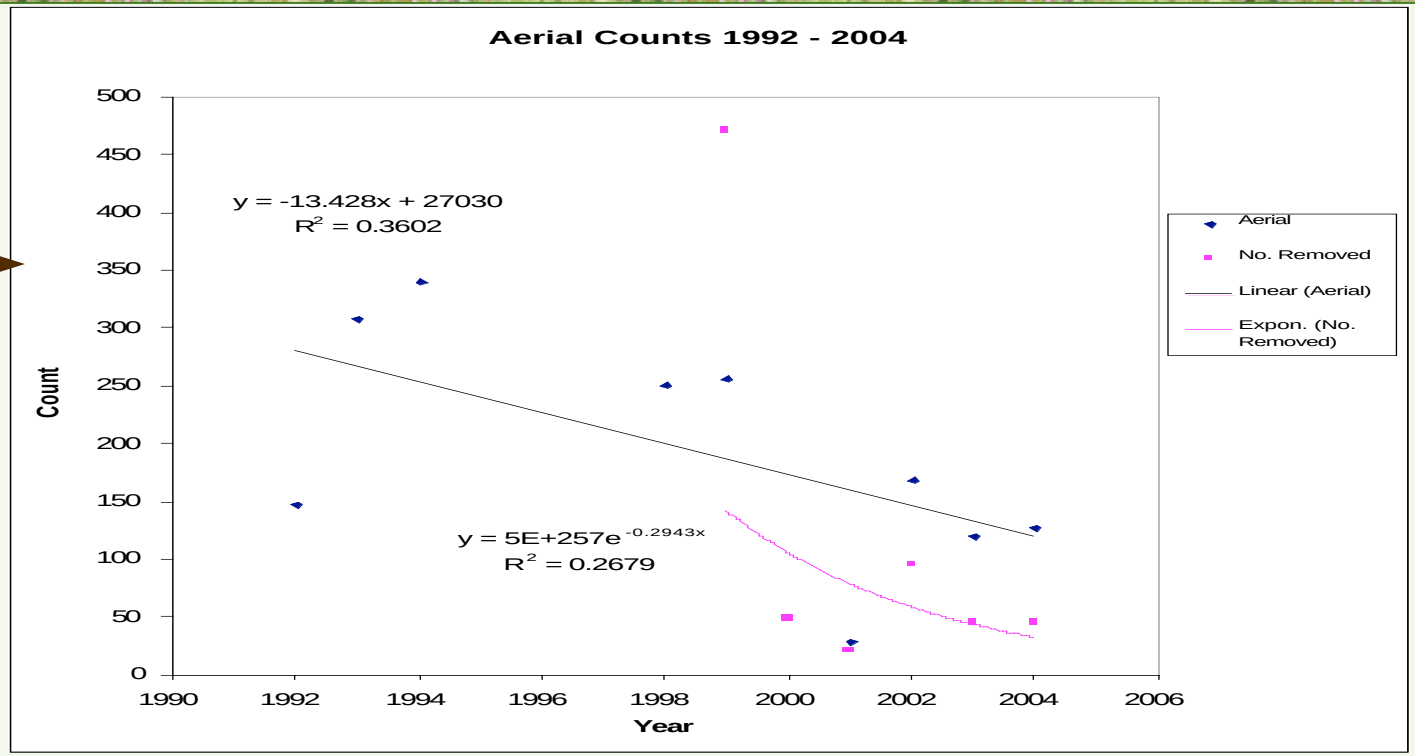
Deer Control at Fermi

Year	Aerial	Removed	Sex Ratio	Age	Weight
1992	148				
1993	308				
1994	340				
1995					
1996		450			
1997					
1998	251				
1999	256	47	1.04	2.2	100
2000		49	0.69	2.4	139
2001	29	21	0.75	1.7	127
2002	169	96	0.68	2.2	128
2003	120	46	0.45	1.7	126
2004	128	46			

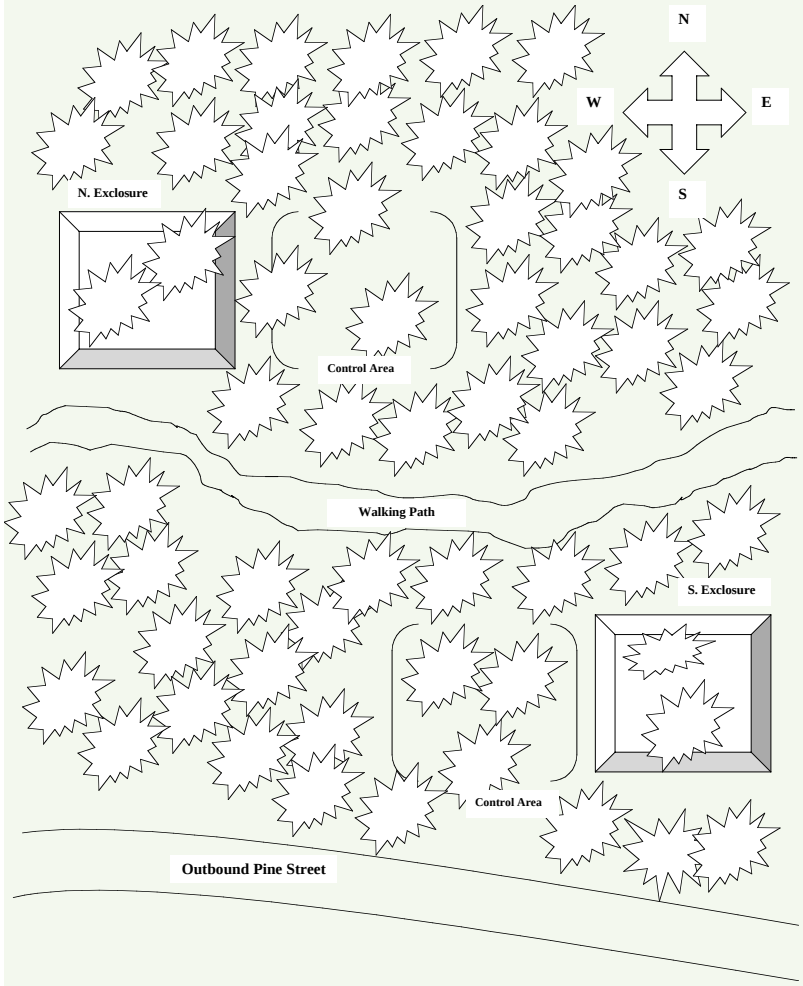
- 1996 was the first year for deer removal at Fermilab-We removed 450 Deer!
- Aerial counts are conducted from a helicopter.
- Fermilab must receive a permit yearly that allows the sharp-shooting method for deer control.
- Fermilab must provide justification to the DNR to receive this permit.

For Those more Visually Inclined





Big Woods Areas of Study



- Creating Visual Resources
- Incorporating Technology
- Making Links to Education Topics
- Collecting Data
- Understanding Stats
- Analyzing Data

Stinging Nettle
(Urtica dioica)

Garlic Mustard
(Alliaria officinalis)

Garlic mustard - small flowering plant (L), rosette leaves (R)

Jewelweed
(Impatiens pallida)

False Solomon's Seal (*Smilacina racemosa*)

Solomon's Seal (*Polygonatum biflorum*)

May Apple (*Podophyllum peltatum*)

Jack in the Pulpit
(Arisaema)

Bindweed
(Convolvulus sepium)

Bellwort
(Uvularia perfoliata)

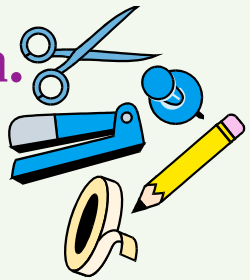
White Trillium
(Trillium grandiflorum)

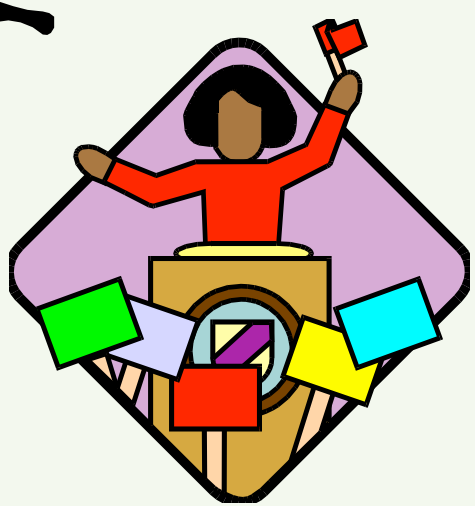
Red Trillium
(Trillium erectum)

Wild Geranium
(Geranium maculatum)

Being Resourceful…

- **I made over 140 color coordinating marking flags!**
- **I created a Plant Identification book w/ 13 species of plants. (Spray Laminate works on Fresh Florals!)**
- **I produced a mini aerial pictorial of each study area.**

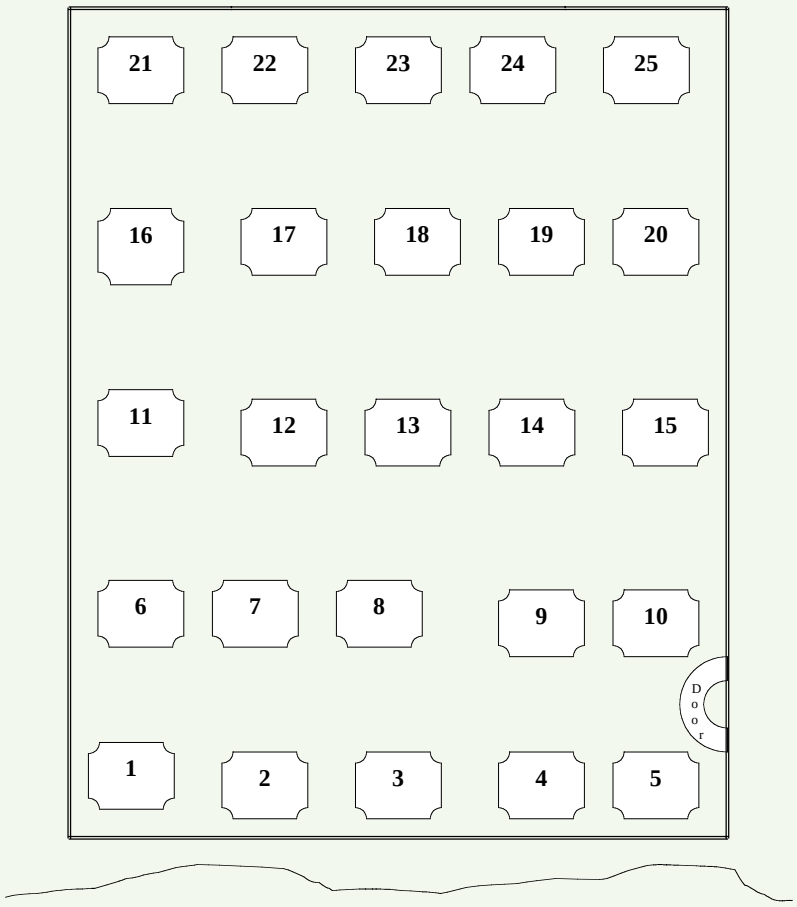




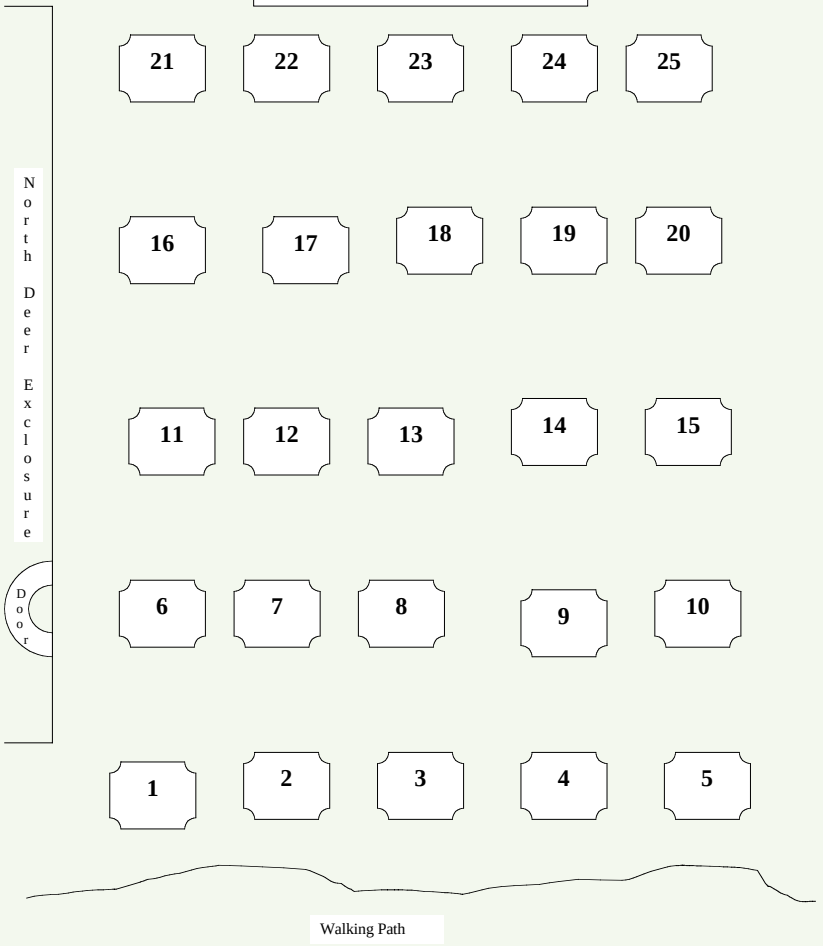
North Deer Exclosure

North Control Area

North Deer Exclosure Quadrant Map

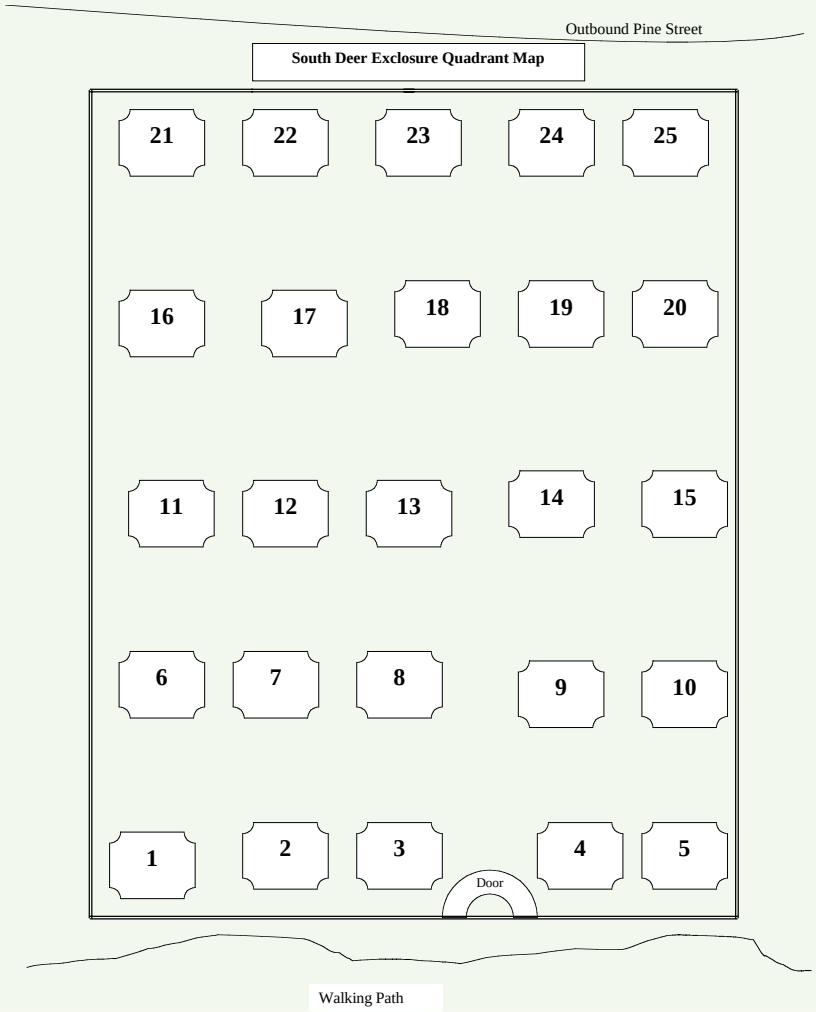


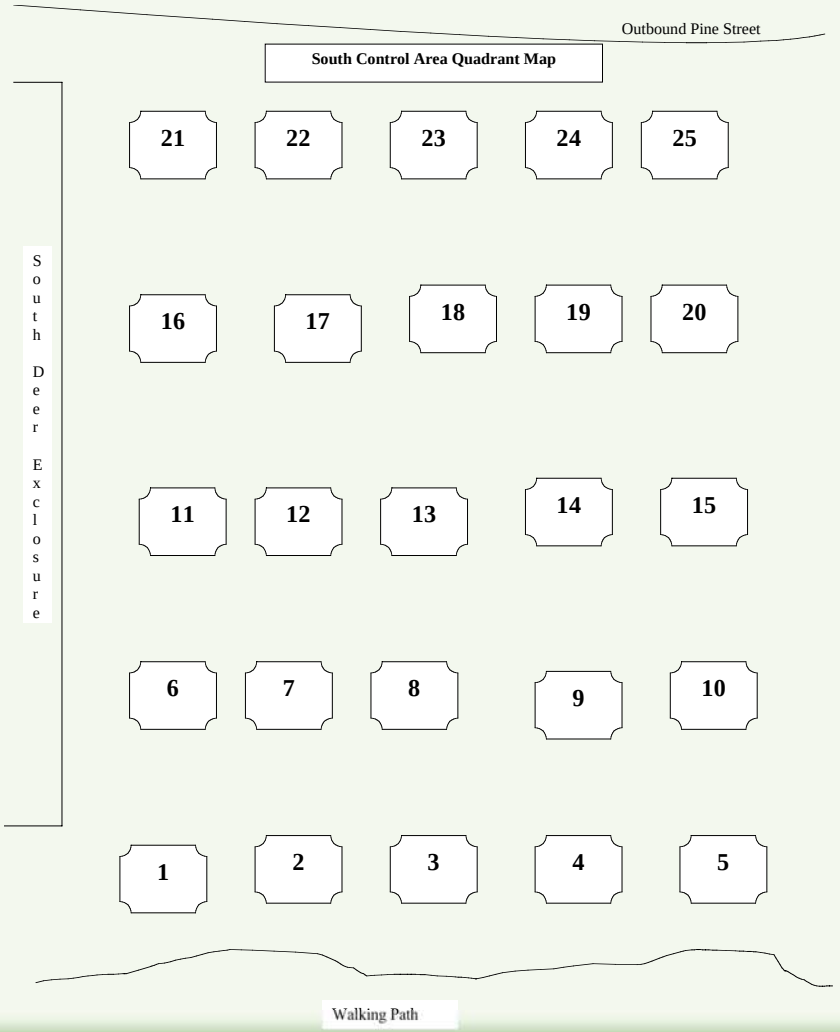
North Control Area Quadrant Map



South Deer Exclosure

South Control Area





How I Organized My Data

N.EXCLOSURE																									
	Q 1	Q 2	Q 3	Q 4	Q 5	Q 6	Q 7	Q 8	Q 9	Q 10	Q 11	Q 12	Q 13	Q 14	Q 15	Q 16	Q 17	Q 18	Q 19	Q 20	Q 21	Q 22	Q 23	Q 24	Q 25	
%Cover	90%	20%	85%	95%	10%	95%	80%	70%	100%	100%	30%	75%	95%	100%	45%	40%	90%	60%	45%	5%	10%	95%	90%	25%	10%	**SUM**
Average H	16 in	10 in	13 in	14 in	14 in	15 in	15 in	18 in	24 in	17 in	14 in	15 in	18 in	20 in	10 in	13 in	13 in	12 in	13 in	6 in	6 in	14 in	14 in	12 in	5 in	
Max. H.	21 in	16 in	17 in	22 in	20 in	25 in	25 in	21 in	29 in	27 in	18 in	17 in	22 in	26 in	24 in	16 in	20 in	25 in	24 in	8 in	10 in	20 in	20 in	17 in	13 in	
W.Trillium	4		5				P	P							P	P	5		P				5	5	P	**24**
R.Trillium																										**0**
SolomonS.	5		4			P		P				5	4				4	4	5	P			3	4		**38**
F.S.Seal		5		4	5		5		4		5		3	4	3	5										**43**
S.Nettle				5									5													**10**
G.Mustard	3	4	3					4					2					3		5	4				5	**33**
J.in Pulpit																										**0**
W.Geranm				P			3				P		P	3												**6**
Bindweed																										**0**
MayApple																										**0**
Jewelweed	1											4				4		P		P						**9**
Bellwort																										**0**
Other	2					5					4	3					3	2			5	4				**28**
																								Total=		**191**

KEY

Most Abundant Plant Species=5

4

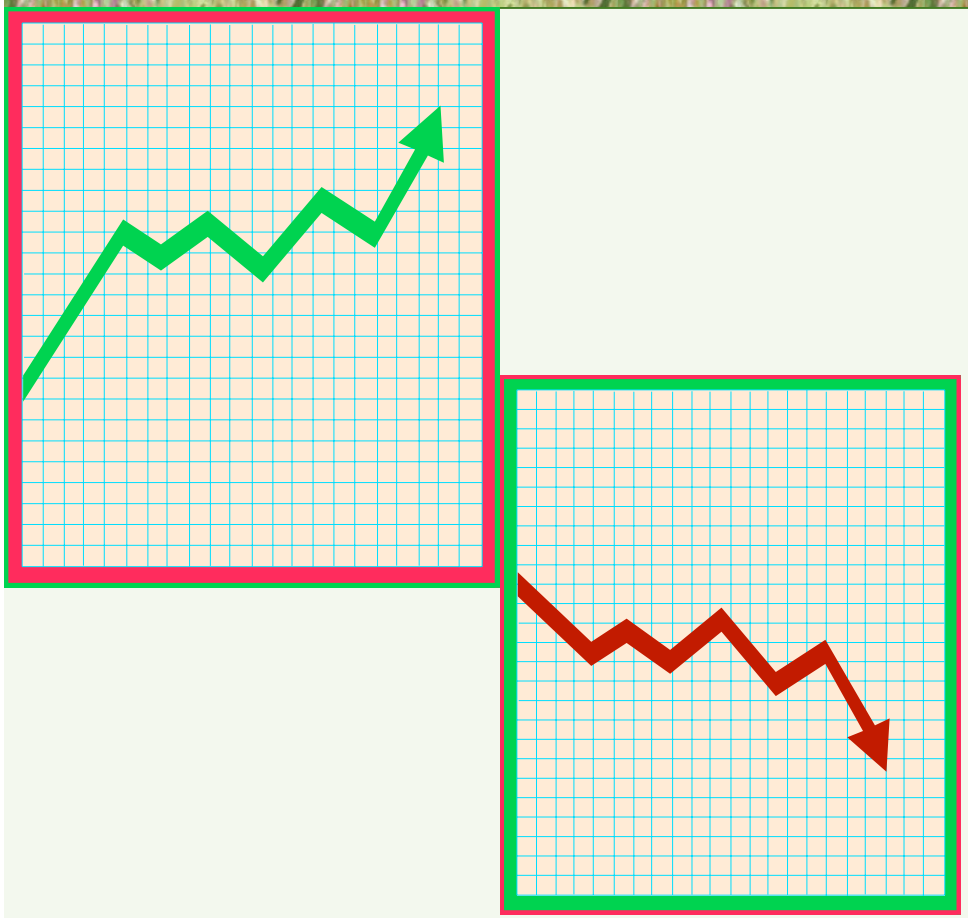
3

2

Least Abundant Plant Species=1

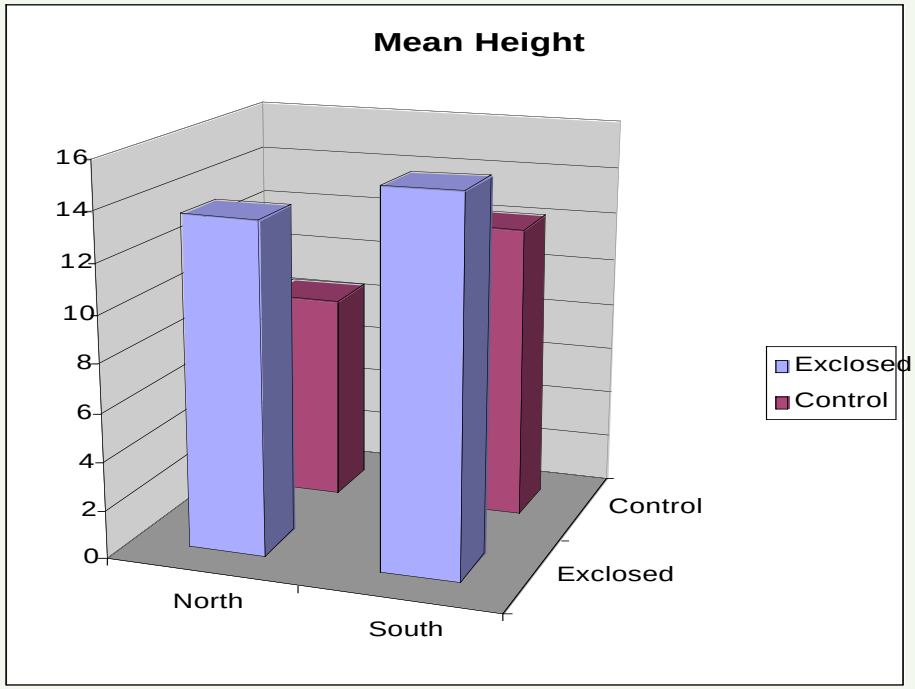
P=Present, One or Two Plants Represents this Species

The Statistical Side of Things



- My Variables:
  - North Deer Exclosure
  - North Control Area
  - South Deer Exclosure
  - South Control Area
  - North vs. South
- Null Hypothesis:
  - There is no difference between my variables
- Working Hypothesis:
  - There is a difference between my variables

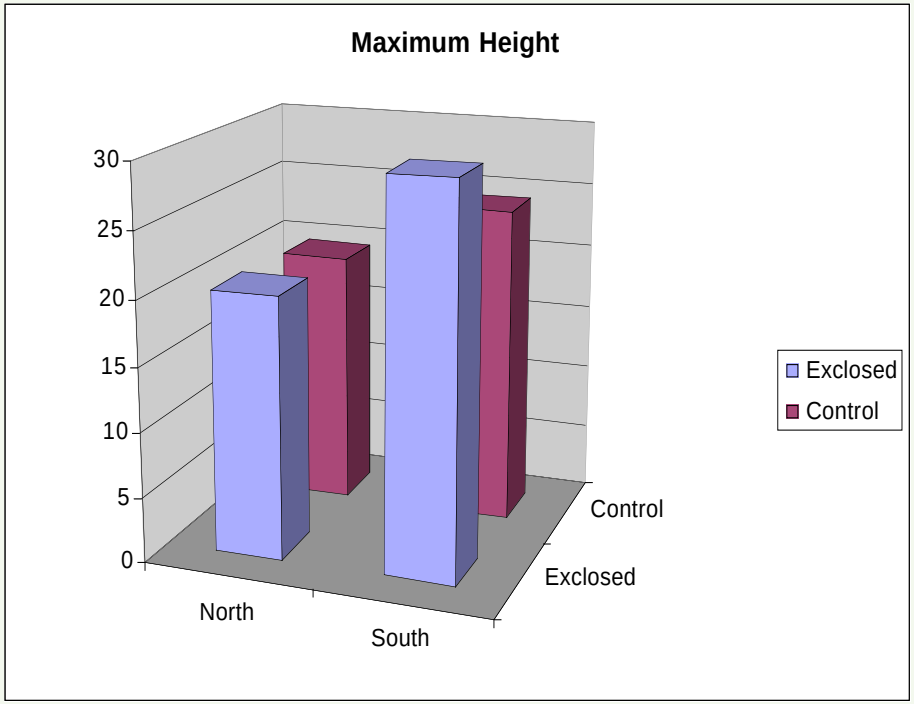
Comparing Average Plant Height in the Big Woods



- Comparisons stretch from Exclosure to Control and from North to South

Comparing Maximum Plant Height in the Big Woods

- Comparisons stretch from Exclosure to Control and from North to South

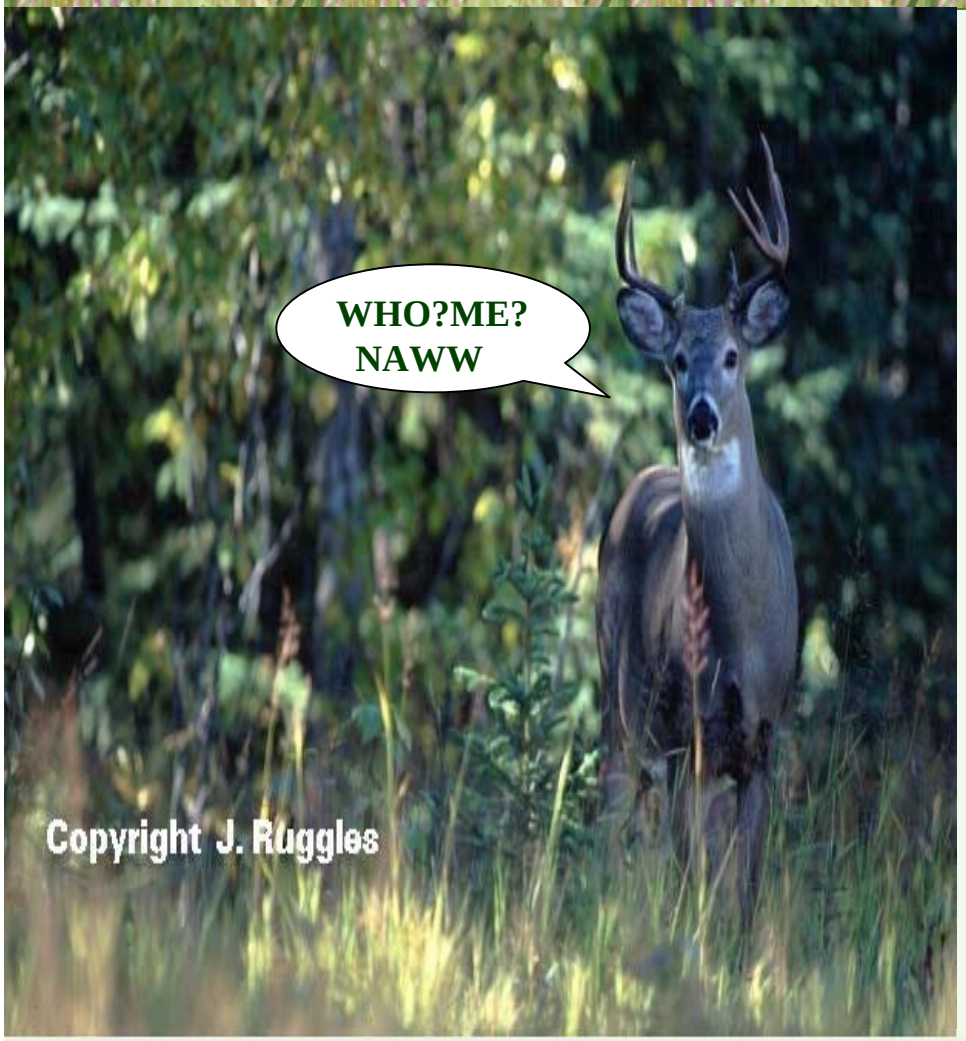


Just to be Sure……

Similarity			
	N. Exclosure	N. Control	S. Exclosure
North Control	34		
South Exclosure	42	42	
South Control	43	68	19

- This chart shows similarities of species diversity
- Compares areas with alike species present
- Numbers represent % similarity between areas
- The white boxes have no significance

"The Deer Need to Eat too" ~Rod Walton



- Can I conclude that the deer at Fermi are to blame for these differences in vegetation conditions?

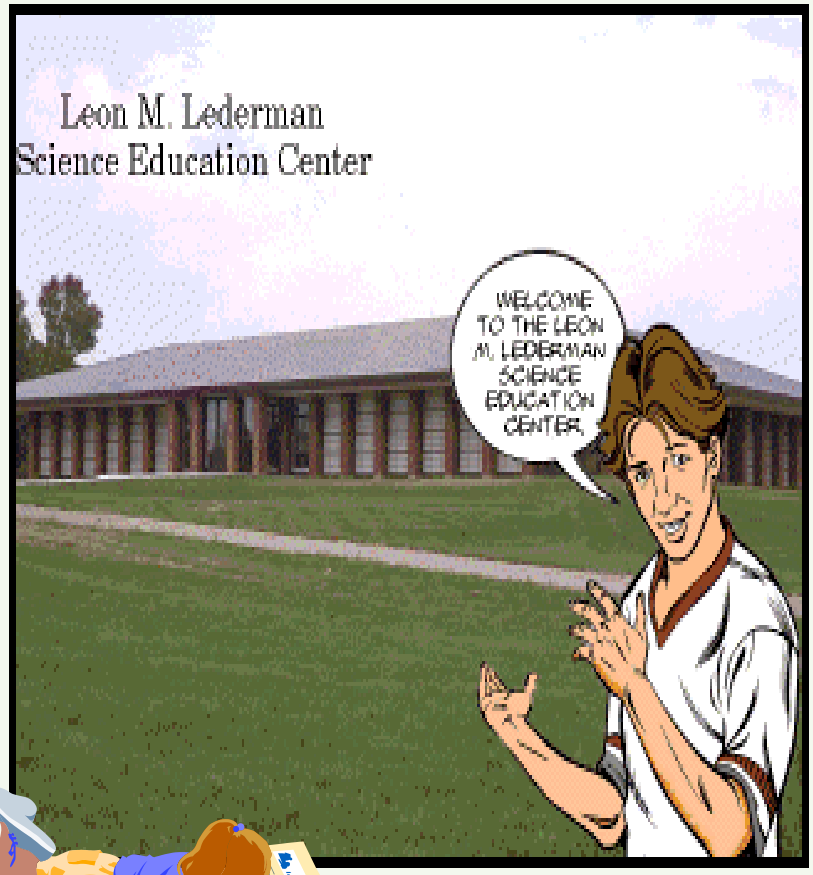
Making Inferences

- No! I didn't have time to be sitting around waiting for deer to show up and eat in my study areas!
- I have no 'evidence'.
- However, I can assume or *infer* that they may have something to do with the differences in vegetation height & density because:
  - I *know* that the deer have been excluded from two of my study areas.
  - I have proven the Null Hypothesis incorrect.

EAT ON!

- With the continuance of deer control at Fermi-there is enough vegetation to go around for all and still see improvements in Big Woods Vegetation! Keep up the good work!

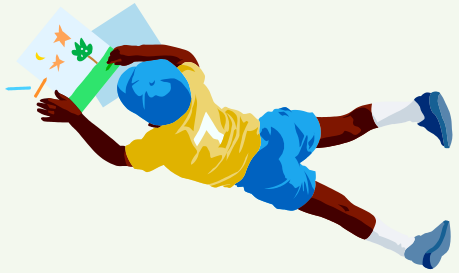
Educational Links



N.E.T Girls:
- Working in both Labs
- Kryogenics Show

Harvey Fieldtrip:
- Bison
- Bug Identification
  - Stream
  - Prairie
- Walk in the BigWoods

ISTA Conference:
- Workshops
- Resources & Materials



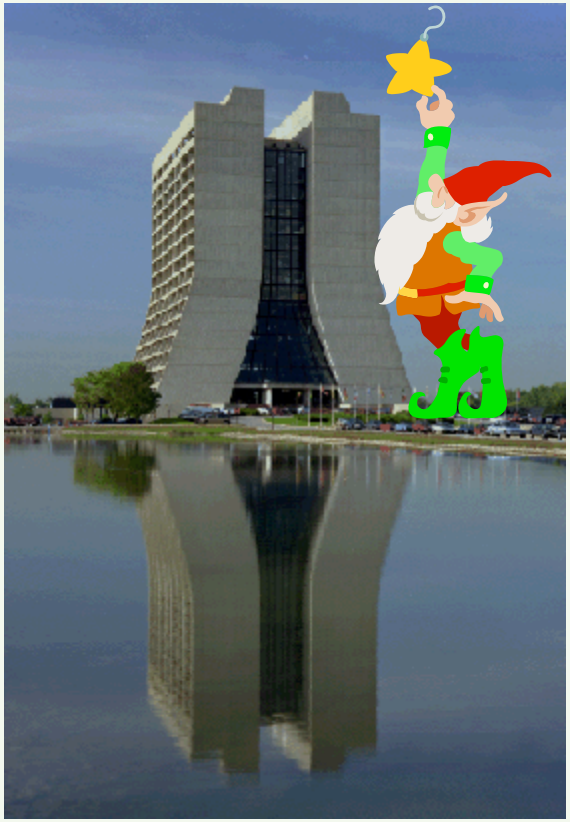
"If all you people weren't so interesting, I'd get a whole lot more work done around here"
~Priscilla Meldrim

THANK YOU!!!

- Thank you for the resources & ideas.
- Thank you for sharing Buffalo Chips & Prairie Tea.
- Thank you for including us in your work & for sharing your space.
- Thank you for fieldtrips to Lowes & Gander.
- Thank you for all the 'I don't know's, but let's find out'.
- Thank you for your care & concern.
- Thank you for your smiles & laughter.
- Thank you for your unending support!

THE END

Like Putting the Star on Top of a Christmas Tree, This Project is Finished!



Thank You Fermilab- Until We Meet Again!